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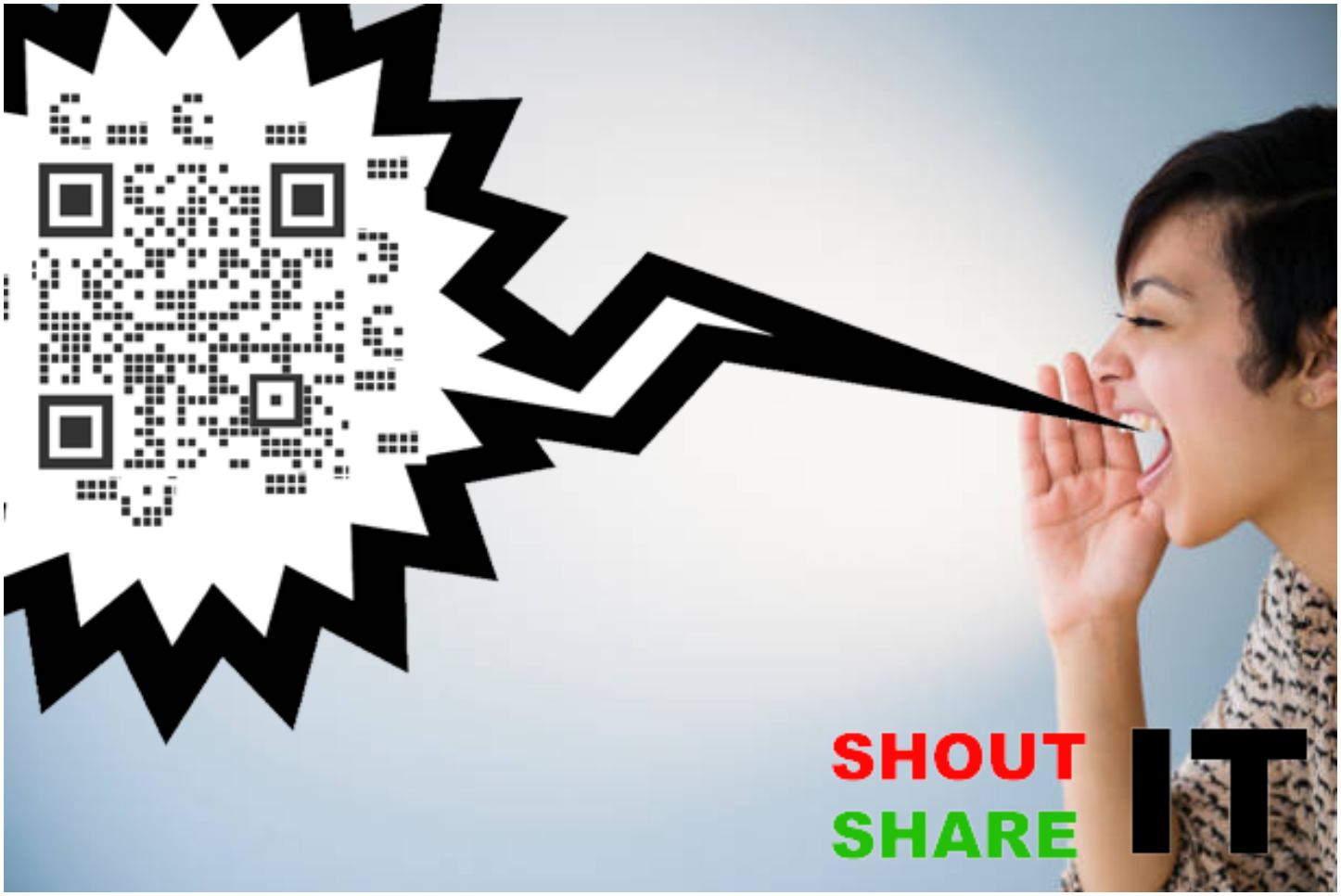
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A 3-YEAR PATTERN OF DISPERSED RECREATION AND FOREST FIRES IN PACIFIC NORTHWEST FORESTS[1]

by Mack L. Hogans, Research Social Scientist

Abstract

An exploratory study was conducted to determine the role recreationists played in the cause and prevention of wildfires in dispersed areas of selected Pacific Northwest Forests for a 3-year period, 1975-77. The study revealed that recreationists played both a desirable and an undesirable role. It suggests that the desirable role can be enhanced through prescribed management and research. The implications of the findings for management and future research are presented.

KEYWORDS: Recreation use (-forest damage, recreationists, fire prevention, fire causes (forest), dispersed recreation.

INTRODUCTION

An integral part of public natural resource management is to provide wild-land recreation opportunities while minimizing losses from wildfires (Folkman 1972). To accomplish this goal requires sound information about the fire hazards (accumulation of fuels and difficulty of access for fire suppression activity) and risk (the activities of recreationists). Historically, dispersed recreation in undeveloped wild-land areas was perceived to be a high wildfire risk that caused widespread destruction of forests. Developed campgrounds and picnic sites originally emerged in this country as an attempt to concentrate recreationists and minimize fire danger associated with use of dispersed areas (Ellison 1942). Today, dispersed recreation--defined as day activities and camping at informal undeveloped recreation sites along roads (Hendee et al. 1976b) and in roadless areas--is very important. It is one of the fastest growing forms of outdoor recreation, and public demand is steadily increasing.[2] Resource managers are charged with meeting this demand through resource management programs that enhances opportunities for recreation.

The degree to which resource managers might encourage or discourage dispersed recreation may be affected in part by their perception of its impact on natural resources and related values because of the danger of wildfire. In the Pacific Northwest the forest fire danger associated with increasing levels of dispersed recreation is of widespread concern to management. A recent survey found that 86 percent of the key land managers in Oregon and Washington generally perceive the wildfire risk as one of

[1]This study was conducted under a cooperative research agreement between the USDA Forest Service and the University of Washington's College of Forest Resources.

[2]USDA Forest Service. An assessment of the Nation's renewable resources 1980: A resources planning act report draft summary. Washington, D.C.

the major problems of dispersed recreation (Downing and Moutsinas 1978). They have attempted to reduce the fire danger through costly prevention, regulation, and enforcement programs. As an example, in 1979 the USDA Forest Service will spend over $2.6 million on prevention of wildfire in Washington and Oregon alone. Furthermore, recreationists in the Pacific Northwest are required to have a shovel, a bucket, and an axe if they camp outside the developed sites on USDA Forest Service lands. Fire patrols routinely travel forest roads and trails as a means of discovering and suppressing wildfires in dispersed areas. They also remind recreationists to be careful with fire and issue citations to those who violate agency fire policy. An important issue is whether or not these programs are effective and if managers' perception of the fire danger associated with recreation use in dispersed areas is real (Downing and Moutsinas 1978). At stake are valuable natural resources, large sums of public money, and benefits to recreationists.

Despite the concern about the potential for large and costly wildfire from dispersed recreation, the reality of the risk from this use is generally unknown. Although much is known about the fire hazards in dispersed areas, only recently has research provided data on dispersed recreationists which can help to establish risk[3] (Hendee et al. 1976b). This Research Note provides additional insight on the recreationists' role in causing wildfires so that fire management and prevention programs will more clearly reflect the reality of the problem in dispersed areas.

In this Note, I describe the relationship between wildfires and recreation use in dispersed areas on selected National Forests in Oregon and Washington.[4] I compared data from forest fire reports for a 3-year period (1975-77) with information on recreation use for the same time on three National Forests. The purpose of the study was to determine the role recreationists played in the cause, cost, prevention, control, and reporting of wildfires in dispersed areas. Specific objectives were to answer the following questions: How many wildfires resulted from recreation use in dispersed areas over a 3-year period? How large were they? When did they occur? How long did it take to control them? What was the range of costs for controlling the wildfires? Who reported and discovered the wildfires? What were users' perceptions of danger of fire in these settings? And finally, what were their preferences for prevention measures?

Results of this study can help managers strengthen their fire management and prevention programs in dispersed areas; in addition, they may determine if their concern about the wildfire risk from dispersed recreation is warranted.

METHODOLOGY

Individual fire reports from Forests on the study area were the principal source of data. These reports were completed by USDA Forest Service personnel each time a wildfire was discovered and suppressed in dispersed areas. We used six categories of information on a fire from the individual reports: (a) cause; (b) size; (c) time of discovery (hour, day, month); (d) amount of time required to control the fire; (e) cost for controlling; and (f) who discovered and reported the fire.

The fire reports were collected and aggregated from the Mount Baker-Snoqualmie, the Wenatchee, and the Mount Hood National Forests. The reports were then summarized. The cause of the fire was

[3] Clark, Roger N., Russell W. Koch, Mack L. Hogans, and Harriet H. Christensen. A profile of dispersed recreationists along forest roads in three forest areas of the Pacific Northwest: Their recreation patterns, opinions, and attitudes. Unpublished data on file at Wildland Recreation Research Project, Seattle, Wash.

[4] It is important to note that developed recreation sites on Forest Service lands have been fireproofed. Technically, no fire reports are made even if wildfires occur there. Because of this, it was impossible to compare the incidence of wildfires in developed areas with wildfires in dispersed areas.

The risk of large and costly wildfires from recreation use in dispersed areas is a major concern to resource managers.

compared with the other categories listed above. These data were supplemented with survey data on dispersed recreationists in selected drainages of the three Forests (see footnote 3).

Study Areas

The three Forests represented a cross-section of Forests in the Pacific Northwest where much dispersed recreation took place and the number of recorded wildfires was high.

Mount Baker-Snoqualmie National Forest:--The Mount Baker-Snoqualmie is located on the west side of the Cascade Range in western Washington. It is considered an urban Forest, drawing heavily on residents from the metropolitan Seattle area. It contains 1,128 miles of hiking, horseback riding, and motorized vehicle trails; and over 3,800 miles of forest roads where much dispersed recreation takes place. Dispersed recreation for the 3-year study period on the Mount Baker-Snoqualmie exceeded 5.2 million visitor-days.

Wenatchee National Forest:--The Wenatchee is located in the geographical center of Washington State. It contains 2,482 miles of trails for hiking, horseback riding, and motorized vehicle use. It has over 3,000 miles of forest roads and is just under a 2-hour drive from metropolitan Seattle. For the study period, dispersed recreation reached 9.9 million visitor-days.

Mount Hood National Forest:--Located in north-central Oregon, the Mount Hood is a little over a half-hour drive east from metropolitan Portland. The Forest lies on both sides of the Cascade Range; about 70 percent of its land area is on the west slope and the remainder on the east. It has 1,163 miles of hiking, horseback riding, and motorized trails, and just over 3,000 miles of forest roads. For the study period, 5.6 million visitor-days of dispersed recreation were recorded.

FINDINGS OF THE STUDY

The major findings are summarized and supported with tables. Then they are discussed, and implications for management and research are suggested. Finally, conclusions are drawn.

Wildfires caused by recreation were small.--Tables 1 and 2 show that recreation use was responsible for many small wildfires during the study period (1975-77). Of the 1,130 wildfires reported on the three Forests, 39 percent were the result of recreational activity in dispersed areas. Escaped, abandoned, or smoldering campfires were the leading cause, followed by smoking and miscellaneous activity (origin or cause generally unknown or undetermined). Recreation played only a minor role in wildfires resulting from use of equipment, burning debris, incendiary (deliberately set) fires, and children's activities. Fires by children in dispersed settings resulted from their playing with matches and fireworks.

Even though recreational activity in dispersed areas accounted for 39 percent of all reported wildfires, the overwhelming majority of these fires (93 percent) burned an area less than one-quarter acre (table 2). Many (number undetermined because of the inconsistency of reporting procedures) were "spot fires" that burned an area no larger than the size of the causative agent, such as a cigarette or a spark from a controlled campfire.

It is important to note some of the circumstances surrounding the reporting of fire statistics in the campfire categories (98 percent of total recreation-caused wildfires). If an unattended campfire is discovered by USDA Forest Service patrols in dispersed areas, they usually extinguish the fire and make a report even if the fire had not escaped. This may happen even if the recreationist has left the campsite for only a few minutes; e.g., to hike to a nearby stream within view of the campsite. Similarly, some recreation campsites in dispersed areas are located away from heavy fuels, such as gravel bars and deserted log landings, and pose little wildfire danger. Nevertheless, many times formal fire reports are made even for smoldering campfires which have little chance for escape. In some instances, formal fire reports are made of campfires in the presence of users who do not have a shovel, a bucket, and an axe in dispersed settings.

Table 1--Number and percent of wildfires, by cause and use, on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, 1975-77

Cause	Recreation use		Nonrecreation use		Total	
	Number	Percent	Number	Percent	Number	Percent
Campfires	287	98	5	2	292	26
Smoking	97	79	26	21	123	11
Miscellaneous	33	41	47	59	80	7
Children	10	50	10	50	20	2
Use of equipment	9	23	31	78	40	4
Incendiary	5	33	10	67	15	1
Burning of debris	2	2	80	98	82	7
Lightning	0	0	444	100	444	39
Railroad	0	0	34	100	34	3
Total and average	443	39	687	61	1,130	100

Table 2--Number and percent of recreation-caused wildfires on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, by size of fire, 1975-77

Cause	Size class (number of acres)										Total Total	
	A (0.25 or less)		B (0.26-9)		C (10-99)		D (100-299)		E (300-999)			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfire	263	92	20	7	1	0	1	0	2	1	287	65
Smoking	95	98	2	2							97	22
Miscellaneous	29	88	4	12							33	7
Children	9	90	1	10							10	2
Use of equipment	9	100									9	2
Incendiary	5	100									5	1
Burning of debris	2	100									2	0
Total and average	412	93	27	6	1	0	1	0	2	1	443	100

Without this equipment on site, the campfire is determined "uncontrolled" even though recreationists are present. The full extent to which the above is happening is not fully known but it has important implications for management, especially about fire danger based on raw data.

Even though recreation-caused fires were generally small, there is the potential for large recreation-caused wildfires in dispersed areas. Seven percent of the recreation-caused wildfires ranged in size from class B to E (0.26 to 999 acres). Escaped campfires and miscellaneous recreational fires led in these size classes.

Some impromptu recreation sites in dispersed settings are located away from heavy fuels and pose little risk of wildfire.

Recreation-caused wildfires required relatively little time and cost to be brought under control.--Of the 443 reported recreation-caused wildfires, 71 percent were brought under control in less than 1 hour (table 3). Over one-third (35 percent) were controlled in less than 15 minutes. A large proportion (69 percent) cost less than $100 in personnel time and suppression equipment to be brought under control (table 4). Many of these were probably abandoned or unattended campfires.

Only a few recreation-caused wildfires in dispersed areas required considerable time and cost to be brought under control. The more costly fires were of class size B and larger, and most were on the Wenatchee National Forest which is considered a dry and hazardous fire area in the semiarid region of Washington State.

A comparison of recreation-caused with nonrecreation-caused wildfires shows that nonrecreation-caused wildfires tend to be larger and more costly (table 4); however, the relative differences are not great. The majority of recreation-caused wildfires cost less than $100 to be brought under control, whereas most of the nonrecreation-caused wildfires cost between $100 and $500. Because of USDA Forest Service fire reporting procedures and changes in the fire budgeting process during the study period, actual costs for the control of wildfires could not be determined. The figures presented here, however, represent an accurate range of costs for control efforts.

Recreation-caused wildfires were strongly related to times and locations of heavy use of areas of dispersed recreation.--Not surprisingly, the greatest incidence of recreation-caused wildfires (88 percent) on the three Forests occurred in the summer and fall months of June through October (table 5). These months have the most recreation use and are the most hazardous for fire in the Pacific Northwest. Typically, campfires and smoking associated with hunting, fishing, and firewood gathering in dispersed areas cause most of the wildfires related to recreation in the months of November and December.

Almost two-thirds (66 percent) of all recreation-caused wildfires were discovered either during or shortly after weekends (table 6). This finding is no surprise and is consistent with the observation that dispersed recreation use peaks on weekends (Hendee et al. 1976b). Many of the wildfires discovered during weekdays occurred in late summer and during the fall hunting season.

Generally, recreation-caused wildfires were found at low to middle elevation ranges (table 7); 61 percent were in the 1,500 to 3,500-foot range. The number of recreation-caused wildfires was dramatically lower at higher levels. This was not surprising because most dispersed recreation use takes place at lower levels (Hendee et al. 1976b), and less fuels and fewer roads are found at higher elevations.

Recreationists play a major role in discovering and reporting wildfires in dispersed areas.--Recreationists in dispersed settings actually discovered and reported a substantial number (26 percent) of wildfires during the 3-year period (table 8). They discovered and reported two-thirds as many wildfires (from all causes) as they reportedly caused. A striking observation is that they discovered and reported more wildfires than fire patrols did (10 percent more). Fire patrols surpassed recreationists in the discovery of wildfires for only one category (campfires). As a general rule, recreationists are more mobile and outnumber fire patrols in dispersed areas; therefore, they have more opportunities to discover wildfires. The discovery and reporting of wildfires in dispersed areas by recreationists suggest that they are concerned about fire danger.

The greatest number of recreation-caused wildfires were discovered between 1 and 4 p.m. and between 9 a.m. and noon. Discovery time in many of these instances was related to routine fire patrol schedules rather than the recreationist's use of fire. It should be noted, however, that 10 percent of the recreation-caused wildfires were discovered between the hours of 6 p.m. and 6 a.m. when fire patrols are usually off duty. This suggests that recreationists who are in dispersed settings also discover and report wildfires during times when it

Table 3--Number and percent of recreation-caused wildfires on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, by length of time to control the fires, 1975-77

Cause	Length of time required to control wildfires (minutes)									
	0-15		16-30		31-60		61-90		91-120	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	106	37	48	17	59	21	23	8	17	6
Smoking	33	34	16	16	22	23	15	15	4	4
Miscellaneous	11	33	4	12	6	18	6	18		
Children					1	10	5	50	3	30
Use of equipment	2	22	2	22	2	22			1	11
Incendiary	2	40	2	40					1	20
Burning of debris							1	50		
Total and average	154	35	72	16	90	20	50	11	26	6

Cause	121-150		151-180		Over 180		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	9	3	7	2	18	6	287	65
Smoking	2	2			5	5	97	22
Miscellaneous	1	3			5	15	33	7
Children			1	10			10	2
Use of equipment					2	22	9	2
Incendiary							5	1
Burning of debris			1	50			2	0
Total and average	12	3	9	2	30	7	443	100

Table 4--Number and percent of recreation- and nonrecreation-caused wildfires on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, by costs for control, 1975-77

Cause	Costs for controlling wildfires, in dollars												Total	
	0-100		101-500		501-1,500		1,501-5,000		5,001-25,000		over 25,000			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	206	72	51	18	17	6	6	2	3	1	4	1	287	65
Smoking	63	65	21	22	9	9	4	4					97	22
Miscellaneous	20	61	7	21	5	15	1	3					33	7
Children	7	70	3	30									10	2
Use of equipment	4	44	4	44			1	11					9	2
Incendiary	4	80					1	20					5	1
Burning of debris	1	50	1	50									2	0
Total recreation-caused wildfires and average percent	305	69	87	20	31	7	13	3	3	1	4	1	443	100
Total nonrecreation-caused wildfires and average percent	171	25	317	46	112	16	59	9	15	2	13	2	687	100

Table 5--Number and percent of recreation-caused wildfires on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, by month, 1975-77

Cause	March		April		May		June		July		August	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	1	0	3	1	11	4	24	8	83	29	50	17
Smoking					3	3	8	8	28	29	22	23
Miscellaneous			1	3	1	3	6	18	14	42	3	9
Children							4	40	4	40	2	20
Use of equipment					1	11			4	44	1	11
Incendiary			1	20			1	20	1	20	1	20
Burning of debris											1	50
Total and average	1	0	5	1	16	4	43	10	134	30	80	18

Cause	September		October		November		December		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	56	20	38	13	19	7	2	1	287	65
Smoking	16	16	14	14	6	6			97	22
Miscellaneous	6	18	2	6					33	7
Children									10	2
Use of equipment	2	22	1	11					9	2
Incendiary	1	20							5	1
Burning of debris					1	50			2	0
Total and average	81	18	55	12	26	6	2	0	443	100

Table 6--Number and percent of recreation-caused wildfires on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, by day of week, 1975-77

Cause	Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Monday		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	27	9	23	8	21	7	29	10	45	16	90	31	52	18	287	65
Smoking	5	5	5	5	11	11	7	7	23	24	28	29	18	19	97	22
Miscellaneous	6	18	2	6	3	9			5	15	13	39	4	12	33	7
Children	1	10	2	20	1	10			2	20	3	30	1	10	10	2
Use of equipment	1	11	1	11	1	11			3	33	2	22	1	11	9	2
Incendiary					1	20	1	20			2	40	1	20	5	1
Burning of debris							1	100							2	0
Total and average	40	9	33	7	38	9	39	9	78	18	138	31	77	17	443	100

Table 7--Number and percent of recreation-caused wildfires on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, by elevation, 1975-77

Cause	Elevation (feet above sea level)									
	0-500		501-1,500		1,501-2,500		2,501-3,500		3,501-4,500	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	2	1	20	7	80	28	88	31	55	19
Smoking			4	4	34	35	32	33	16	17
Miscellaneous			6	18	12	36	9	27	6	18
Children			1	10	8	80			1	10
Use of equipment	1	11			3	33	1	11	3	33
Incendiary			1	20	1	20	2	40		
Burning of debris					1	50			1	50
Total and average	3	1	32	7	139	31	132	30	82	19

Cause	4,501-5,500		5,501-6,500		6,501-7,500		7,501-8,500		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	34	12	7	2			1	0	287	65
Smoking	8	8	3	3					97	22
Miscellaneous									33	7
Children									10	2
Use of equipment	1	11							9	2
Incendiary	1	20							5	1
Burning of debris									2	0
Total and average	44	10	10	2			1	0	443	100

Table 8--Number and percent of wildfires discovered and reported by recreationists, fire patrols, and others on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests, 1975-77

Cause	Recreationists		Fire patrols		Others		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Campfires	85	29	96	33	111	38	292	26
Smoking	46	37	25	20	52	42	123	11
Miscellaneous	40	50	10	13	30	38	80	7
Children	13	65			7	35	20	2
Use of equipment	19	48	1	3	20	50	40	4
Incendiary	9	60	1	7	5	33	15	1
Burning of debris	26	32	6	7	50	61	82	7
Lightning	47	11	37	8	360	81	444	39
Railroad	13	38	2	6	19	56	34	3
Total and average	298	26	178	16	654	58	1,130	100

is impractical for agency officials to be on duty. Recreationists may also extinguish wildfires caused by other recreationists or by natural causes, such as lightning, but not report this action to agency personnel. The Wildland Recreation Research Project witnessed this behavior on several occasions during the 1976 field season. The full extent to which this occurs is not known.

Users' perception of fire danger and fire prevention measures.--Table 9 and 10 show results of a recent survey conducted on selected drainages on the three Forests to determine recreationists' perception of fire danger in dispersed settings (see footnote 3, page 2).

Overnight users and day user had somewhat different perceptions of fire danger from dispersed recreation (table 9). Experience with fire and familiarity with dispersed recreation areas are important explanation variables for users' perception of fire danger. For example, impromptu campsites, where much overnight use occurs, are generally found near water (streams, lakes). And overnight users are required to have firefighting equipment on hand before they can camp. The security of easy access to water and firefighting equipment may shape the perception of overnight users about the lack of fire danger. Weather conditions and season of the year can also influence users' perception.

Table 10 shows that both day and overnight users had fairly close agreement on their views about appropriate fire prevention measures in dispersed settings. Agreement was strong among users that recreationists should carry a shovel, a bucket, and an axe in dispersed areas. Users also felt strongly that installing fire prevention signs, closing some roads, and even prohibiting fires when danger is high were acceptable prevention measures. There was moderate to strong opposition, however, to increasing fire patrols and closing entire areas. There may be several reasons for this opposition.

Closing an entire area may be viewed as a drastic measure--and unwarranted--based on the recreationists' experience with fire in dispersed settings. It is the only option among the six in table 10 that suggests permanency of closures and prohibition of fire use.

Increasing the frequency of fire patrols may be seen as a more direct attempt to regulate the use of fire and other desired activities of recreationists in dispersed areas; their voluntary options are displaced by this selection--a notion that may be unacceptable to users. This type of high visibility management is more characteristic of developed recreation areas.

DISCUSSION AND IMPLICATIONS FOR MANAGEMENT AND RESEARCH

Data from this study have important implications for management and research. They are discussed below.

Management's perception of fire danger from dispersed recreation.--The risk of wildfire from dispersed recreation is clearly established by data from this study; i.e., some wildfires occur as a result of this use. This would suggest that management's concern about this use is sometimes justified and restricting it under hazardous conditions is warranted. This suggestion, however, must be put in perspective.

Many recreation-caused wildfires were small spot fires. Only 7 of 100 went on to burn an area larger than one-quarter acre. Over half were controlled in less than 30 minutes. Even though a few fires were expensive to put out, more than two-thirds cost less than $100 to be brought under control. Furthermore, recreationists discovered and reported two-thirds as many wildfires (from all causes) as they reportedly caused. We also know--but not to what extent--that, during the same time, recreationists safely used, enjoyed, and suppressed a large number of campfires and cooking and warming fires. It appears that an irresponsible few are to blame for the fire problem in dispersed areas. In view of this, a reexamination of managers' perception of fire danger from recreation use in dispersed areas is warranted. This suggests the need for management strategies that consider the benefits dispersed recreationists provide to management in fire prevention.

From a management standpoint, any

Table 9--Percent of agreement that there is a great danger of recreationists accidentally starting a forest fire in dispersed recreation area drainages on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests

Type of user	Disagree	Neutral	Agree
Overnight users (N=884)	48	17	35
Day users (N=1224)	34	18	48

Source: Clark, Roger N., Russell W. Koch, Mack L. Hogans, and Harriet H. Christensen. A profile of dispersed recreationists along forest roads in three forest areas of the Pacific Northwest: Their recreation patterns, opinions, and attitudes. Unpublished data on file at Wildland Recreation Research Project, Seattle, Wash.

Table 10--Percent of agreement of recreationists' preferences of fire prevention measures in dispersed recreation area drainages on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests

Fire prevention measure	Overnight user (N=884)	Day user (N=1224)
Carry shovel, bucket, and axe	91	87
Prohibit fires when danger is high	81	86
Install prevention signs	88	86
Increase fire patrols	51	50
Close entire area	37	48
Close some roads if danger is high	80	85

Source: Clark, Roger N., Russell W. Koch, Mack L. Hogans, and Harriet H. Christensen. A profile of dispersed recreationists along forest roads in three forest areas of the Pacific Northwest: Their recreation patterns, opinions, and attitudes. Unpublished data on file at Wildland Recreation Research Project, Seattle, Wash.

recreation-caused wildfire in dispersed areas is undesirable because of its potential to spread. Data from this study suggest that a more reasonable fire management goal would be to reduce and eliminate the recreation-caused wildfires in dispersed areas that reach size class B and larger. A companion goal would be to reduce and eliminate all size class A wildfires burning beyond campfire rings that would rapidly spread and become size class B or larger fires. To make this distinction, however, would require collecting additional information for the formal fire reports.

Wildfire reporting procedures.--The current form and procedure for reporting wildfires is limited in producing data to help establish risk of wildfire from dispersed recreation; for example, precise measurements of the area burned from recreation-caused wildfires would be useful. It is also desirable to know if the fires were within fire rings, if they were left unattended, or if users were on the site but without the proper equipment, and so forth. The current reporting system excludes these data.

There is a need to integrate fire management functions with those of recreation planning and research. Research is learning more about users in dispersed areas, and supplemental data about the reported fires would be valuable in developing composite solutions to the wildfire problem. For example, the relationship between fire characteristics and established recreation site characteristics is an important link in understanding and controlling recreation-caused wildfires. A dispersed recreation management and research tool called Code-A-Site (Hendee et al. 1976a) can be used in conjunction with data from fire reports to fill this need. Code-A-Site provides an inventory of dispersed recreation sites and their characteristics and provides a trace measurement of recreational behavior on sites. Whenever possible, wildfire reports should be keyed to the closest informal recreation site identified in the Code-A-Site system.

Positive role of recreationists in fire prevention.--The supportive role that recreationists play in preventing wildfires provides an immediate opportunity for management to implement programs that make this role and behavior more effective. This study found that recreationists in dispersed areas reported a large number of wildfires from recreation and nonrecreation causes. It is conceivable that they also extinguished other wildfires that were never reported. This suggests that many recreationists are inclined to support putting out fires, including ones they did not start. The key is to cultivate and manage this support in a way that fire management goals can be met through intervention of recreation users.

Most USDA Forest Service fire prevention programs are aimed at making people aware of the safe use of fires during their visits to a Forest. This study suggests the need for programs that support and encourage recreationists to quickly report and possibly extinguish any wildfires they discover. Such programs may contribute to a reduction in the size and incidence of wildfires in dispersed areas, since many recreationists have demonstrated their desire and support for this activity. Management and research should develop programs that support the training of recreationists to accomplish this safely and effectively. Developed properly, such a program could save substantial fire prevention and suppression costs while enhancing users' benefits. Recreationists can become useful partners in fire management with the USDA Forest Service. As a general rule, dispersed recreationists are more mobile than USDA Forest Service patrols; if they are going to be traveling roads and exploring in dispersed areas, then management should capitalize on this behavior to strengthen the fire prevention program.

Management and research should also focus on shaping the perception of users in dispersed areas who feel there is only minimal danger of wildfires occurring in these settings. There is a need to stimulate greater vigilance in recreationists to be aware of the fire danger and react in an appropriate manner.

Research needs.--Additional research is needed on the role of dispersed recreationists in wildfire activity to support management programs and benefits

The use of fire appears to be an important part of the recreational experience for recreationists in dispersed areas.

to recreation users. This study raised some important questions that may be answered through additional research:

1. What is the relationship between recreation-caused wildfires and amount of recreation use? Is there an optimal level of recreation use to minimize wildfires? Data from this study suggest that size of wildfires in dispersed areas may actually decrease as levels of use increase since recreationists report (and possibly suppress) wildfires. Experimentation provides an opportunity to test this notion.

2. What potential impacts does restricting the use of fires in dispersed areas have on the experience of users? What are effective ways of reducing the incidence of fires while retaining the integrity of dispersed areas (different from developed "fireproofed" areas) for users' benefits? What uses, needs, and benefits do recreationists experience from fire in dispersed areas? When, why, and how do they use fire?

3. What is recreationists' knowledge of safe use of fire in dispersed areas? Do they know their role in reporting and extinguishing wildfires from other sources? What are effective programs to fill these gaps in information on this problem?

Results of this proposed research could strengthen management-oriented programs to reduce the incidence of recreation-caused wildfires in dispersed areas.

CONCLUSIONS

This study examined the relationship between wildfires and recreation use in dispersed areas on the Mount Baker-Snoqualmie, Wenatchee, and Mount Hood National Forests for a 3-year period, 1975-77. It revealed many of the roles recreationists played in the cause, cost, and prevention of wildfires in dispersed settings. The data showed that recreationists played both a desirable and an undesirable role in this activity. Although data for 3 years on three Forests cannot represent all possible situations, the patterns shown by these data are sufficiently clear to draw the following conclusions (caution should be used in generalizing beyond the study areas and time periods):

Recreation use in dispersed areas can lead to wildfires; but most of them will be small, and many will be discovered and reported by other recreationists. Furthermore, most of these fires will be controlled quickly with relatively little cost to the agency. Generally, recreationists perceive dispersed settings as having low to moderate fire danger and are supportive of most USDA Forest Service policies, except closing entire areas and increasing fire patrols. Additional management and research programs can lead to a reduction of the risk associated with recreation use in dispersed areas.

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Metric Equivalents

1 inch = 2.54 centimeters
1 mile = 1.609 kilometers
1 acre = 0.405 hectare
32°F = 0°C

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